REMARKS

Applicant respectfully requests consideration of the application in view of the following remarks and amendments.

Claim Status

Claims 1-16 stand rejected.

Drawing Status

The drawings are rejected under CFR 1.83(a) for not showing "every feature of the invention specified in the claims." Specifically, for not showing "projecting of a single illumination source through a diffraction grating as claimed in claims 9 and 16." However, Applicant respectfully submits that the illuminator 31 shown in Figure 3 is described in the present application on page 9, paragraph [0029] in the following manner:

"illuminator 31 can be embodied as a single laser source passed through a holographic/diffraction grating."

Hence, the elements of claims 9 and 16 are shown as illuminator 31 in Figure 3. In view of this, Applicant respectfully requests that the drawing rejection be withdrawn.

Rejections under 35 U.S.C. § 103(a)

Claims 1-16 allegedly stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sorek et al. (Pub. 2001/00410703) in view of Ford et al. (Pub. 2002/0071613).

The test for determining if a claim is rendered obvious by one or more references for purposes of a rejection under 35 U.S.C. § 103 is set forth in MPEP § 706.02(j):

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestions or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combined reference teachings. Second, there must be a reasonable

> expectation of success. Finally, there prior art reference (or references when combined must teach or suggest all the claim limitation. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Therefore, if the above-identified criteria are not met, then the cited reference(s) fails to render obvious the claimed invention and, thus, the claimed invention is distinguishable over the cited reference(s).

In general, the present invention relates to a system and method of reconstructing a digital image of a surface using a single captured image of the surface. The advantage of the present invention is that illumination marks (e.g., fiducials) projected on the image for the purpose of reconstructing the image can be removed using the single captured image. This is in contrast to prior art methods that require capturing multiple images of the surface – one with the illumination marks and one without the mark, in order to remove the illumination marks.

Claim 1 of the present invention recites in part:

"projecting at least three illumination marks on the surface, said illumination marks having a particular characteristic;

capturing a single image of the surface to obtain captured image data;

detecting pixel values corresponding to the illumination marks and their corresponding location on the surface in the captured image data dependent on the particular characteristic;

using the location if the illumination marks in the captured image data to correct for distortion of the image and the surface in the captured image data to generate undistorted image data; and

substituting estimated pixel values for the detected illumination mark pixel values in the undistorted image data, the estimated pixel values being determined using neighboring non-illumination mark pixel values."

As shown in Figure 3 and described on page 7 paragraph [0023] of the present application, one embodiment of the present invention uses an illumination

mark removal block 39 "to substitute estimated pixel values obtained from neighboring non-illumination mark pixel values". Hence, illumination marks are removed by "substituting estimated pixel values" as recited in independent Claims 1 and 10.

Sorek et al. does not teach removing illumination marks from a captured image by "substituting estimated pixel values for the detected illumination mark pixel values". In fact, Sorek et al. teaches away from removing the marks by instead reducing the contrast of the projected light so that the marks are less visible. Specifically, Sorek et al. teaches that "CPU 75 then controls the intensity of the light emitted by illumination 76, LEDs 96, and source 99." And "when there is a high contrast between markers 86 and object 81, as CPU 75 can determine from analysis of the image formed on sensor 74, the CPU most preferably reduces the intensity of the light emitted.", page 6, paragraph [0103]. So, instead of removing the marks, Sorek et al. teaches reducing contrast of the markers 86 on the object 81. Hence, Sorek et al. does not teach or suggest "substituting estimated pixel values for the detected illumination mark pixel values" as recited in Claims 1 and 10 and any claims dependent upon Claims 1 and 10.

Ford et al. relates to a technique that identifies defect regions of a digital image using a defect map and uses non-defective regions to correct the defective regions. Ford et al. neither teaches nor suggests projecting and then removing illumination marks by "substituting estimated pixel values for the detected illumination mark pixel values". Intentionally projected illumination marks have different characteristics than unintentional defect regions and as such the detection and substitution techniques as recited in Claims 1 and 10 of the subject invention and that of Ford are inherently different. Hence, although Ford et al. teaches a technique that uses replacing a given pixel by another pixel value, this in no way suggests "substituting estimated pixel values for the detected illumination mark pixel values" as recited in Claims 1 and 10 of the present invention and teaches away by describing replacing unintentionally placed features instead of intentionally placed features as taught by the subject invention. Specifically, defect regions are not intentionally projected on an image for the purpose of reconstructing the image.

Moreover, both Sorek et al. and Ford et al. teach away from combining the references. Sorek et al teaches away by finding an alternate solution to "hiding" the

illumination marks by reducing their intensity. Ford et al. teaches away from combining with Sorek since Ford is only concerned with defects and does not teach or suggest the concept of illumination marks and their removal by substituting neighboring pixel values. No motivation to combine is provided in either reference.

Hence since neither Ford nor Sorek teach or suggest substituting estimated pixel values for the detected illumination mark pixel values" in order to remove the illumination marks and since no suggestion or motivation to combine Ford and Sorek exists within Ford and Sorek, the present invention as recited in Claims 1 and 10 and all dependent claims therefrom would not have been unpatentable in view of these references under 35 U.S.C. 103(a).

Accordingly, Applicant respectfully submits that the rejections have been overcome by these remarks. This application is now in condition for allowance and such action is earnestly solicited. Withdrawal of all rejections is respectfully requested.

Respectfully submitted,

Amnon D. Silverstein

By _____
Susan E. Heminger
Reg. No. 36,449
(650) 236-2738

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Hewlett-Packard Company
Legal Department IPA
P.O. Box 272400
Fort Collins, CO 80527-2400